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EXAMINER

DOLAN, JENNIFER M

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 08/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Applicati n N .

09/895,478

Applicant(s)

HARN DEN ET AL.

Examiner

Jennifer M. Dolan

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 February 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                             | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

*This action is in response to Amdt. C, filed 6/26/03*

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 3-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 3-6 recite the limitations "the lead foot" and "the lead". There is insufficient antecedent basis for this limitation in the claim, since it is unclear as to whether the limitations in the claims are to be applied to the 'first lead', the 'second lead', or both the first and second leads.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S.

Patent No. 6,111,312 to Hirimuta et al. in view of U.S. Patent No. 6,242,800 to Munos et al.

Regarding claim 1, Hirimuta discloses a small footprint semiconductor device package comprising: a plastic package body (13) for enclosing a die (12), the plastic package body including a top coupled to a bottom through a plurality of sides (figure 4); a diepad (17) supporting the die, the diepad having a first side and a second side opposite to the first side (figure 4); first and second leads (14) nonintegral with the diepad and in electrical communication with the die through a bondwire (figure 4), the leads including an enclosed portion (15) by the package body and in electrical communication with the die (figure 4), and an exposed portion of the leads (16) extending from the side of the package body, folding back along the side of the package toward the bottom of the package at a first angle (substantially vertical portion; figure 4), and folding underneath the package bottom toward a center of the bottom of the package to form a first and second lead foot (figure 4), whereupon the portion of the lead along the side of the package and the portion of the lead along the bottom of the package form an angle of less than 90 degrees from each other (figure 4; side portion is substantially vertical, and foot portion is inclined upwards from a horizontal line); and the first and second lead foot being inclined at a second angle (figure 4) relative to an underlying planar PC board (22, column 2, lines 26-32) to promote solder wetting (inherent, due to the shape and inclination of the lead foot).

Hirimuta fails to disclose that the first lead is integral with a first side of the diepad and in electrical and thermal communication with the die through the diepad.

Munos discloses a semiconductor device package in which a first lead (1) is integral with a first side of the diepad (40; see figures 3 and 4) and in electrical and thermal communication with the die(10) through the diepad.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the leadframe of Hirimuta, such that the first lead is formed integral with the diepad, as taught by Munos. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide the first lead integral with the diepad, because Munos shows that providing leads integral with the diepad helps remove heat from the die, such that the device performance is improved (see Munos, column 2, lines 1-5, 55-67; column 3, lines 12-40).

Regarding claim 2, Hirimuta discloses that the die is a flash memory chip (column 4, lines 16-20).

Regarding claim 3, Hirimuta discloses a reverse gull wing shape (figure 4).

Regarding claim 4, Hirimuta discloses that the package has a reduced package profile including the leads (figure 4; column 2, lines 19-23; column 6, lines 56-64).

Regarding claim 6, Hirimuta discloses that the package body further comprises a notch (24) configured to receive a portion of the first and second lead foot (16a; figure 4), thereby permitting the first and second lead foot to be partially recessed within the package body (figure 4) in order to reduce a height of the package.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirimuta et al. in view of Munos et al. as applied to claim 1 above, and further in view of U.S. Patent No. 6,114,759 to Okuaki.

Hirumuta discloses a package wherein the lead foot is inclined at a small angle relative to the planar PC board (figures 4 and 6), but fails to specify the angle or provide a motivation for inclining the lead foot.

Okuaki discloses a small angle inclination of the lead foot relative to the planar PC board (figures 3 and 5) in order to promote solder wetting and maintain a high bond strength (column 3, lines 12-21). The angle is considered to be about 1-7 degrees (see figures 3 and 5), but Okuaki is silent as to the exact angle.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify in Hirumuta as modified by Munos an angle of inclination between the lead foot and the PC board of 1 – 7 degrees. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to incline the lead foot at an angle between 1 and 7 degrees relative to the PC board, because slightly bending the free end of an outer lead away from the PC board promotes solder wetting (Okuaki, column 3, lines 12-21), but bending the free end at a large angle decreases the contact area between the leads and the PC board, which can decrease the bond strength and cause an increase in the total package height. It is well within the purview of a person having ordinary skill in the art to select an angle between 1 and 7 degrees to optimize the solder wetting, bond strength, and package height. Although Okuaki fails to specify the exact angle of inclination of the lead foot, it has been held that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hirimuta et al. in view of Munos et al. as applied to claim 6 above, and further in view of U.S. Patent No. 6,433,418 to Fujisawa et al.

Hirimuta fails to disclose that the notch includes a depth of about two thirds of the thickness of the lead.

Fujisawa discloses a notch (28a) that includes a depth of about two-thirds of the thickness of the lead (figures 8 and 9). Fujisawa is, however, silent as to the exact depth of the notch.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the notch of Hirimuta as modified by Munos, so that the depth is about two-thirds of the thickness of the lead, as suggested by Fujisawa. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to provide a notch with a depth as specified, so that the device can be easily stacked, yet maintain a small profile (Fujisawa, figures 12 and 13). Additionally, a notch of a depth as specified, and as in figures 12 and 13 of Fujisawa, provides the advantages of preventing damage to the leads during assembly or mounting, in the form of short circuiting or deformation (Fujisawa, column 8, line 64 – column 9, line 17), while preventing the lead from retracting entirely into the protective notch during assembly. Although Fujisawa fails to specify the exact angle of inclination of the lead foot, it has been held that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955).

***Response to Arguments***

7. Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new grounds of rejection.

***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (703) 305-3233. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (703) 308-4940. The fax phone numbers



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for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jennifer M. Dolan  
Examiner  
Art Unit 2813

jmd  
August 1, 2003

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800